Question 3:

Probability of a die coming up an odd number each time is 0.5. The times rolled are all independent. Thus, the probability of rolling a die 6 times and getting an odd number each time is 0.5^6 = 1.5625%.

Question 4:

Total number of combinations when the first bit is a 1 is 2^3. For the remaining 3 bits, there are 3 possibilities when at least 2 zeroes are selected consecutively: 001, 100, and 000. The conditional probability is thus 3/2^3 = 3/8 = 37.5%.

Question 5:

a) C(5,3)*0.51^3 *(1-0.51)^2~= 31.85%
b) 1 – probability of no boys at all = 1 – probability of all girls = 1 – (1-0.51)^5 ~= 97.18%
c) 1 – probability of no girls at all = 1 – probability of all boys = 1 – 0.51^5 ~= 96.55%
d) Probability of all boys + probability of all girls = 0.51^5 + (1-0.51)^5 ~= 6.275%
e) Probability of the first child being a boy + probability of the last two children being girls – the intersection of the two = (2^4+2^3-2^2)/2^5 = 62.5%

Question 6:

a) 0.5^5 = 3.125%
b) (1-0.51)^5 ~= 2.82%
c) Multiply the probabilities of having a girl 5 times consecutively:
    a. First iteration: 1 – (0.51 – 1/100) = 0.49 + 0.01 = 0.5
    b. Second iteration: 1 – (0.51 – 2/100) = 0.49 + 0.02 = 0.51
    c. Third iteration: 1 – (0.51 – 3/100) = 0.49 + 0.03 = 0.52
    d. Fourth iteration: 1 – (0.51 – 4/100) = 0.49 + 0.04 = 0.53
    e. Fifth iteration: 1 – (0.51 – 5/100) = 0.49 + 0.05 = 0.54

The probability of having 5 girls is 0.5*0.51*0.52*0.53*0.54 ~= 3.795%

Question 7:

a) p^n
b) 1 – p^n
c) Probability of no failure + probability of one failure = p^n + p^(n-1)*(1-p)^1
d) 1 – probability of at most one failure = 1 – (p^n + p^(n-1)*(1-p)^1)